

# Langley Research Center

1917 ☆ FIFTY YEARS OF SERVICE TO THE NATION ☆ 1967

## TRADITION OF NEARLY HALF CENTURY OF SERVICE TO SCIENCE OF FLIGHT PERMITS LANGLEY STAFF TO LOOK WITH CONFIDENCE TO MOON, PLANETS

In modern wind tunnels and specialized laboratories, in flight research, and in theoretical studies, scientists at the Langley Research Center of the National Aeronautics and Space Administration are looking to the future. Their mission: to advance the science of flight. In accomplishing this goal, Langley initiates pioneering projects in aeronautical and space science and technology, and helps establish the feasibility of undertaking future missions in space as well as laying a broad foundation for the development of spacecraft and aircraft with superior performance.

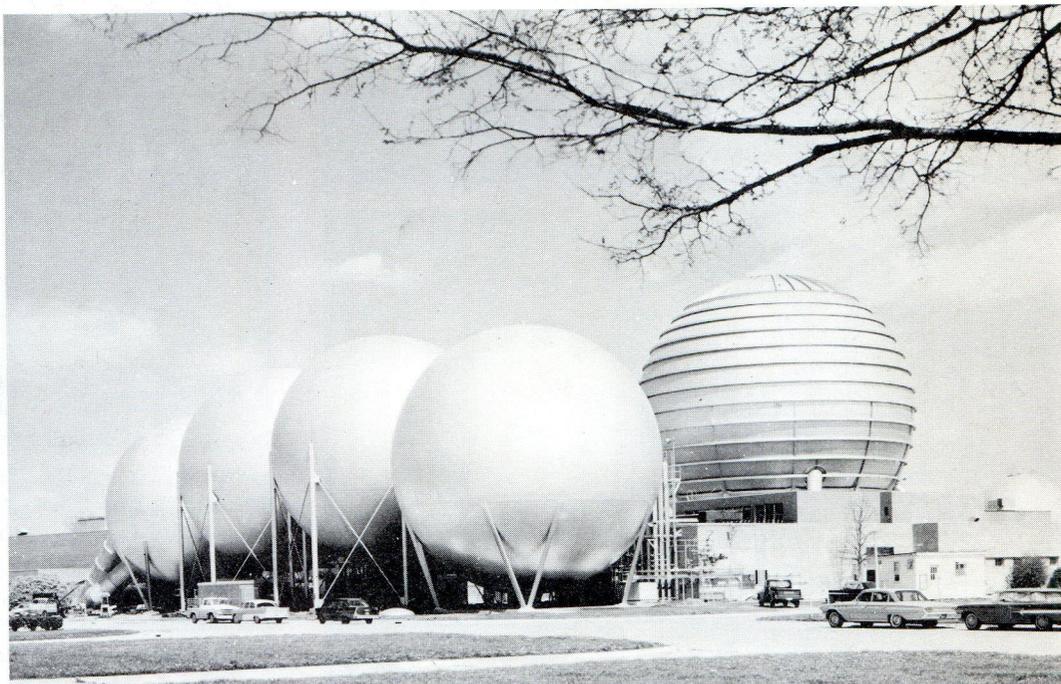
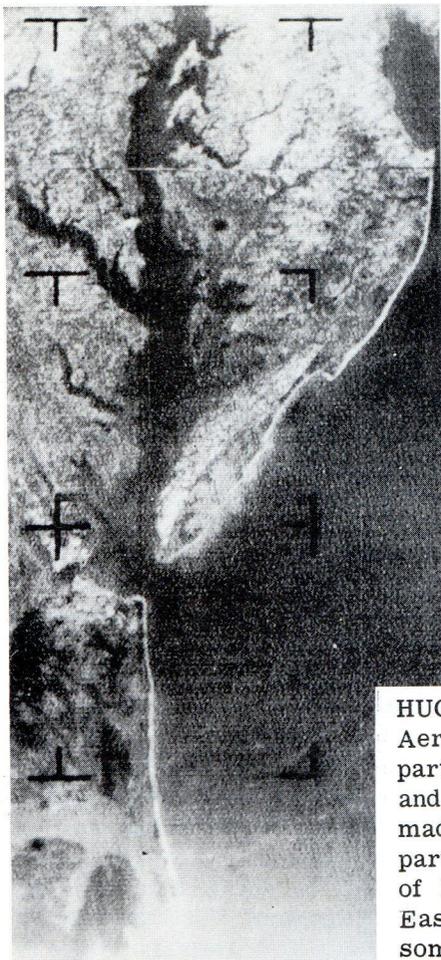
Langley research encompasses many fields and relates to a variety of end objectives. These include launch vehicles, manned and unmanned earth satellites, lunar vehicles, planetary spacecraft, hypersonic flight vehicles, supersonic aircraft of advanced design, vertical takeoff-landing and short takeoff-landing machines and helicopters, and subsonic aircraft with particular reference to the operating problems of transports.

In the space field, there is an intensive study of technical problems associated with possible future missions. Technology relative to a Manned Orbiting Research Laboratory, for example, has been under study at Langley for several years. This basic research includes investigations of the

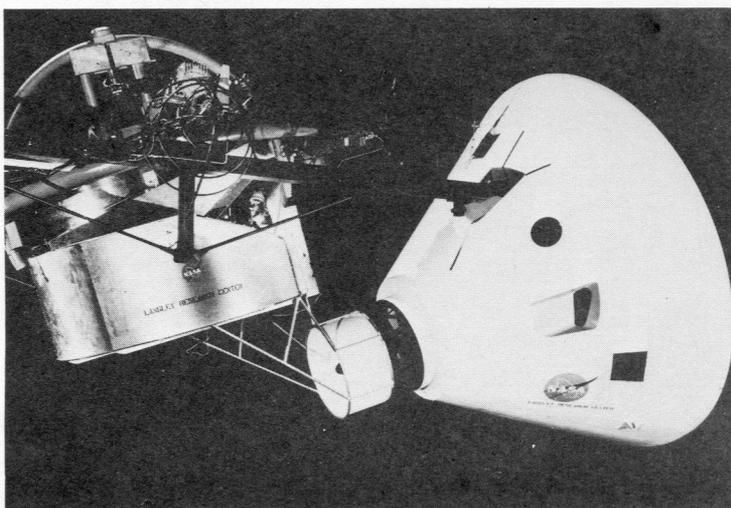
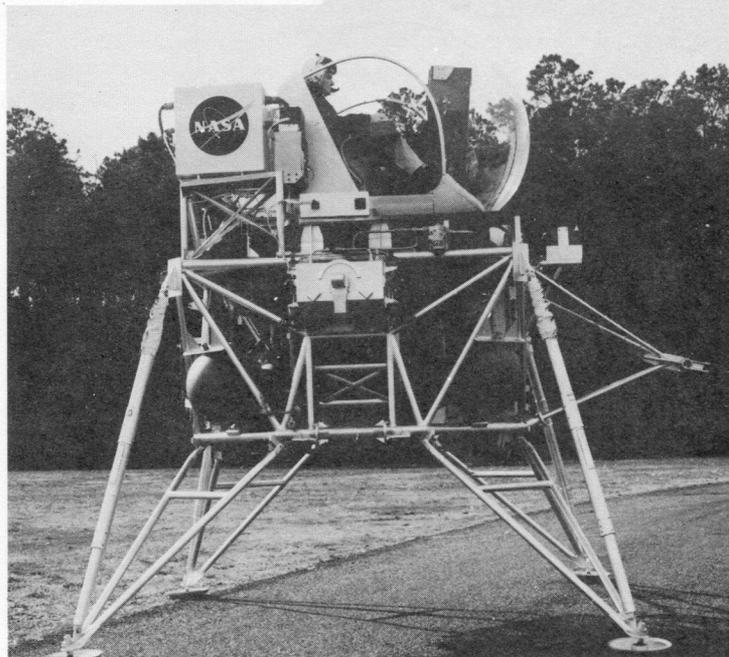
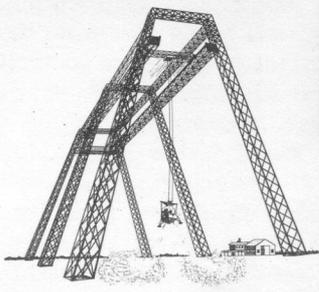
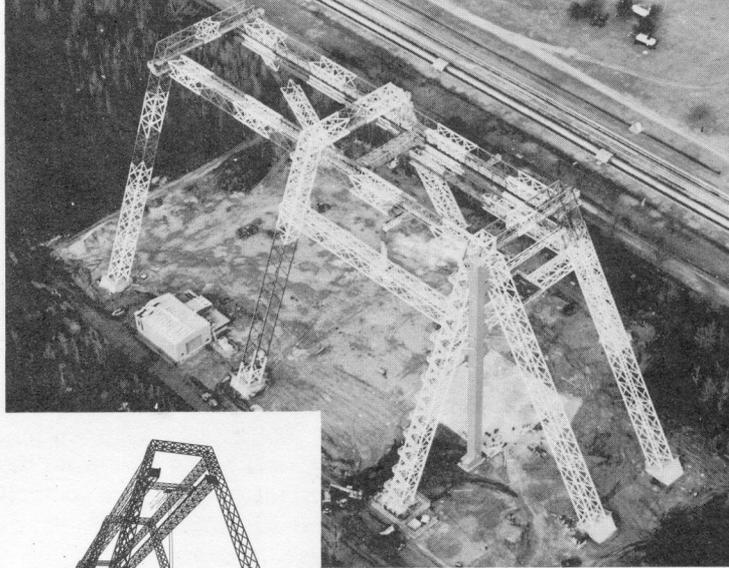
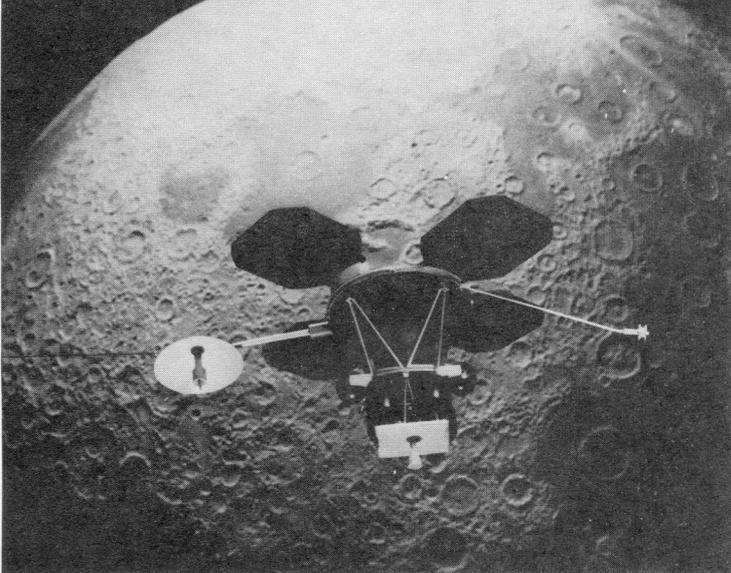
problems of heat balance, structural requirements for resistance to micrometeoroids, and energetic particle radiation as affecting space vehicle mechanisms or occupants, and studies of life support systems.

Langley is conducting extensive research in aeronautics, including a variety of scientific studies to provide basic information for use in the development of an efficient supersonic commercial air transport. Scientists also are seeking solutions to problems that relate to lifting vehicles for flight in the hypersonic range, velocities above five times sonic speed. This research involves not only difficult aerodynamic and structural problems, but basic questions regarding the propulsion to be employed in this speed range.

Langley Research Center has a staff of more than 4,000 scientists, engineers, technicians, and other supporting personnel and laboratories and other facilities which represent an investment by the United States of a quarter billion dollars. Established in 1917, just 14 years after the pioneering flights of the Wright Brothers at nearby Kitty Hawk, Langley has a history of significant accomplishment in the aerospace field over a period of nearly half a century-- a tradition which permits the Center to look with confidence to the stars.

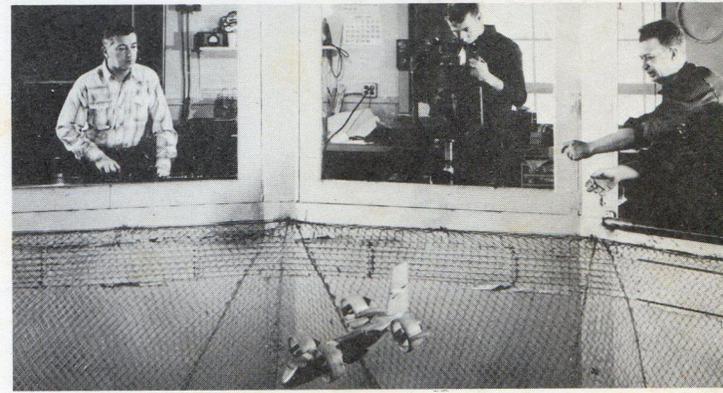
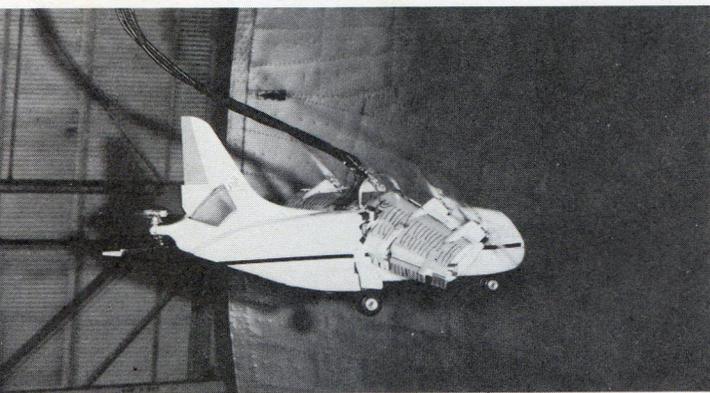
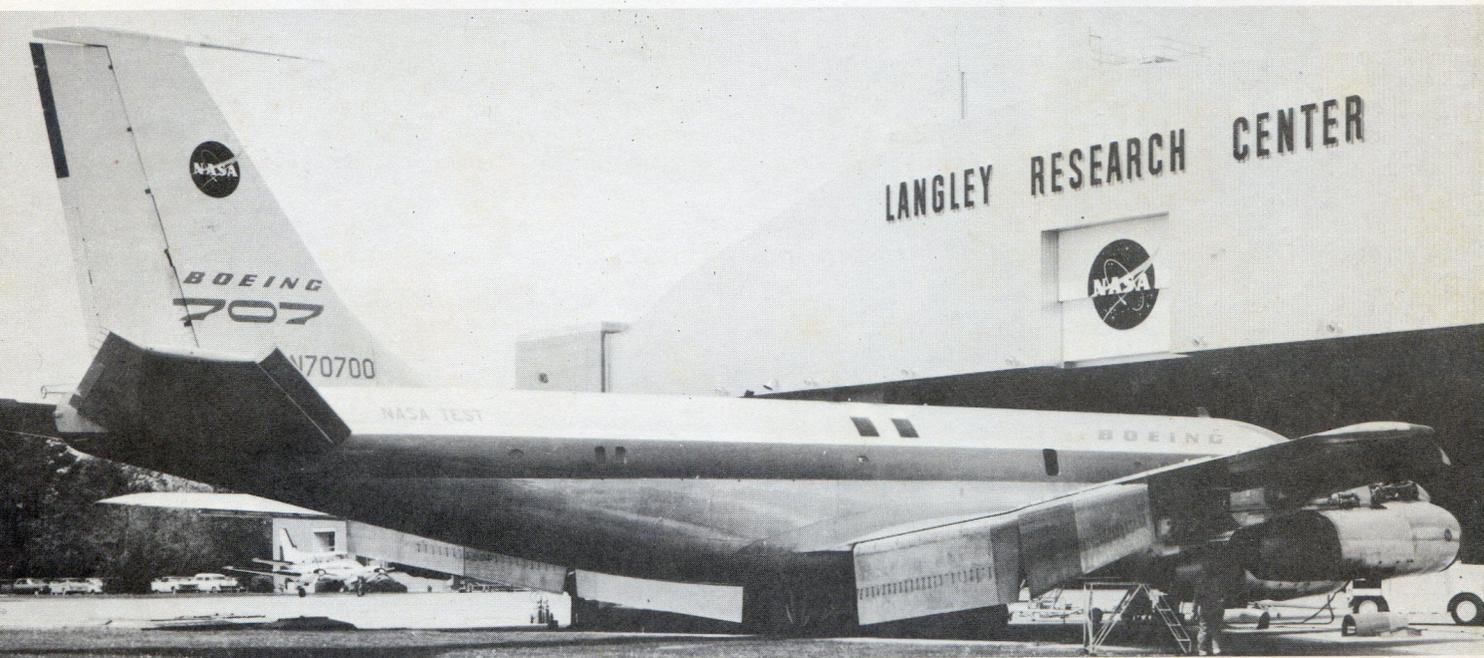
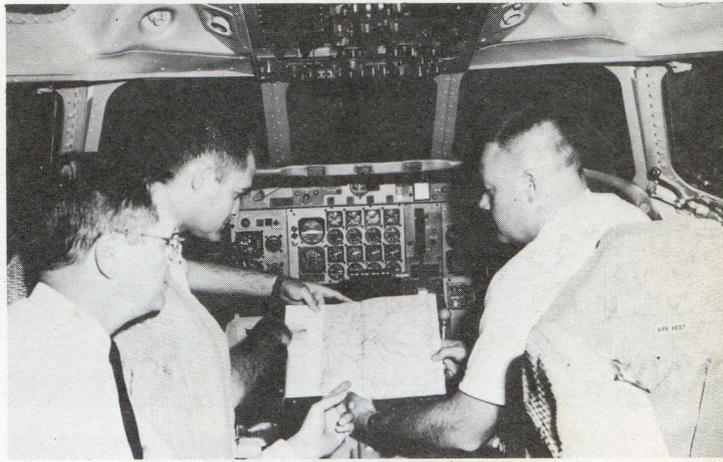
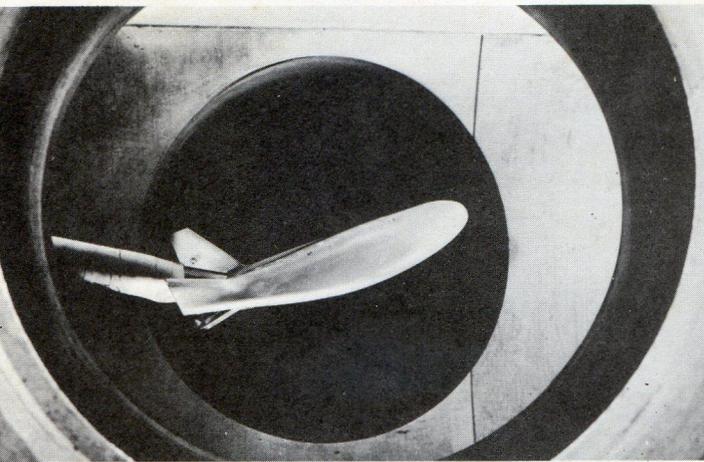


**HUGE VACUUM SPHERES** (above), typical of new space age facilities at the National Aeronautics and Space Administration's Langley Research Center, Hampton, Virginia, are part of several modern laboratories used to investigate problems of very high-speed flight and reentry from space. In the photograph of the eastern section of the United States (left), made by the United States weather satellite Nimbus I, Langley is to the right of the lower part of the cross mark. The picture, made from an altitude of 325 miles on the 138th orbit of Nimbus, shows (from left) the Langley Research Center area, Chesapeake Bay, the Eastern Shore, and the Atlantic Ocean. Photographs on the next three pages illustrate some of Langley's aerospace facilities and research activities.



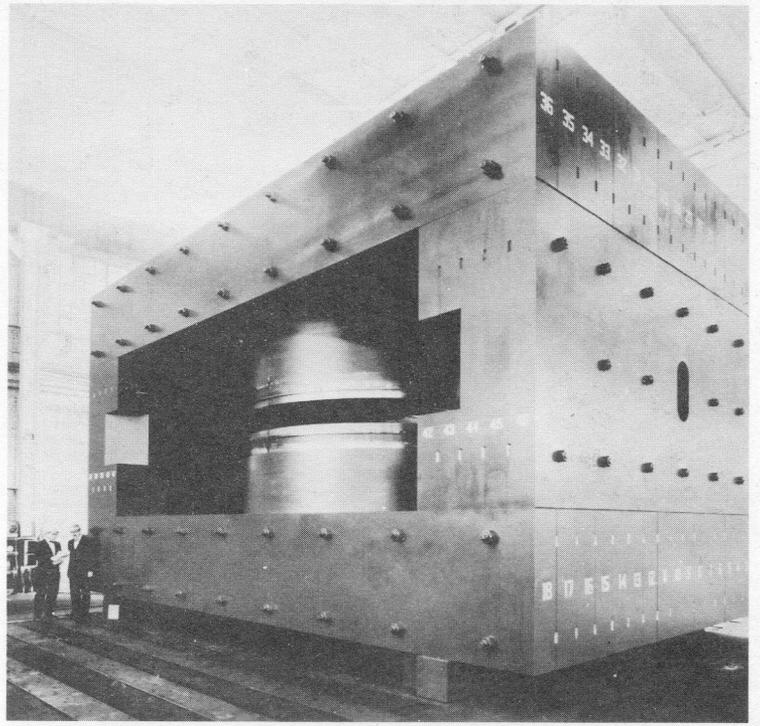
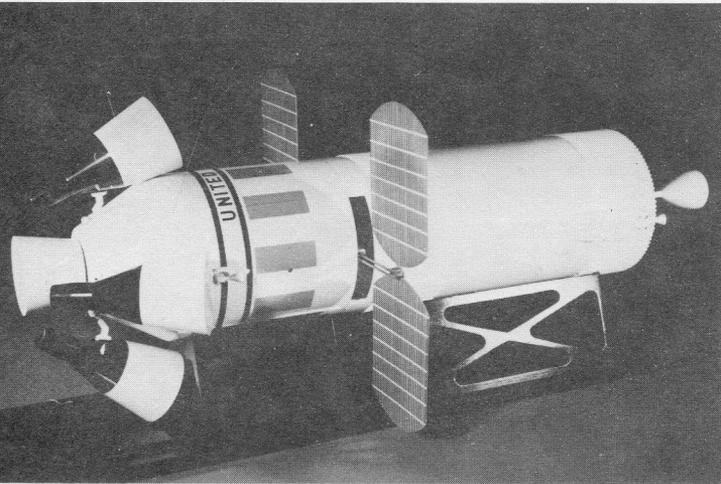
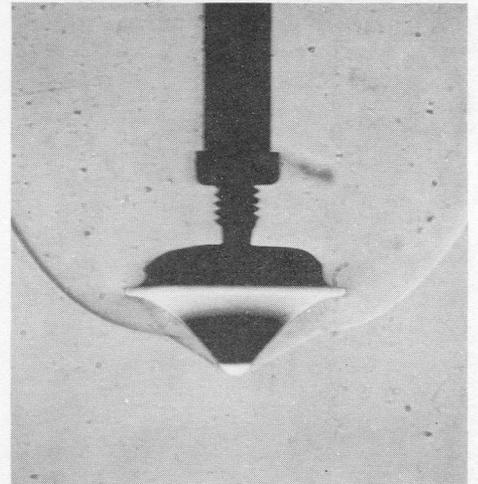
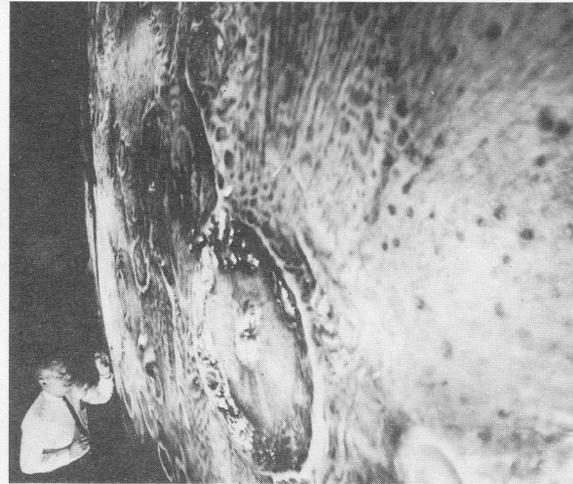
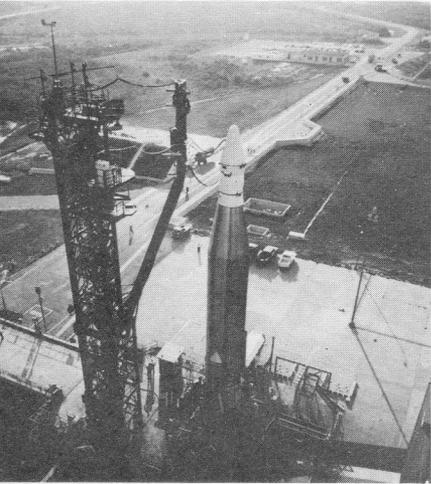
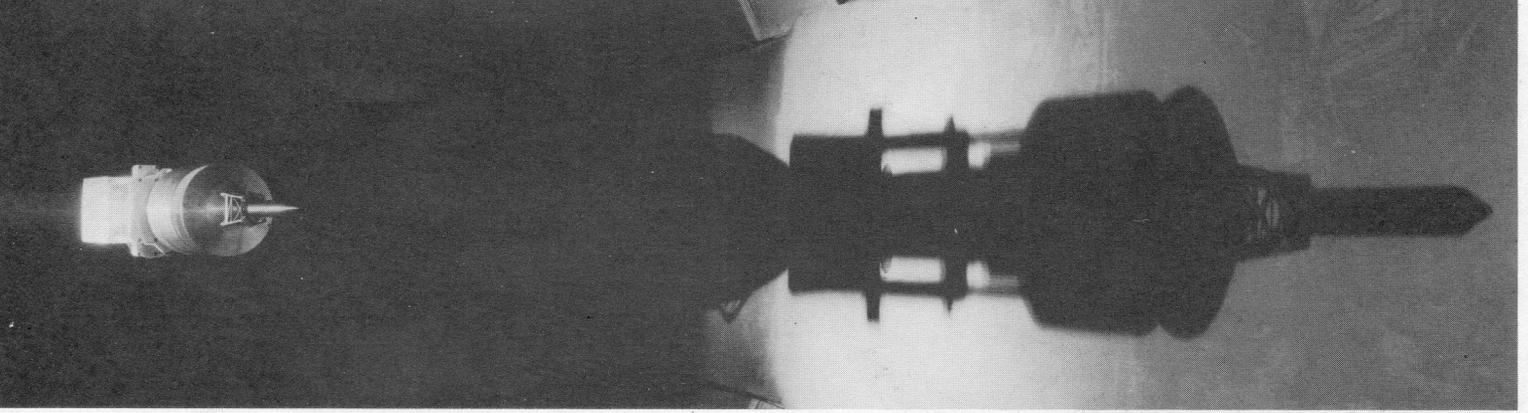
techniques. Suspended from the 250-foot high, 400-foot long steel gantry will be a manned rocket-powered research vehicle (lower right) to study problems astronauts will encounter in landing on the moon. In operation (drawing), the facility will simulate the one-sixth gravity of the moon. In another research device, designed for studying locomotion problems of an astronaut in moving about on the moon, a system of slings suspended from the gantry supports most of the weight of a scientist (center left) and allows him to walk and jump under conditions simulating lunar gravity. Some studies are made with the subject wearing a space suit or a heavy back pack. A facility (lower left) includes the simulated crew section of the Project Apollo Lunar Excursion Module (LEM), which is shown after having been maneuvered by a research pilot to rendezvous and dock with an Apollo model. The two vehicles are supported by an overhead cable system. The simulator includes an analogue computer (not shown).

LUNAR ORBITER is a Langley-managed project to make high resolution photographs of the moon to locate suitable landing sites for the manned mission. Scale Models (top left) show how it will approach to within less than 30 miles of the moon to photograph lunar objects as small as a yard square. First flight is scheduled for 1966 from Cape Kennedy, Florida. Lunar Landing Research Facility (top right) is a controlled laboratory for developing lunar landing



MODEL of the HL-10 lifting-body type reentry vehicle (top left) is studied in a variable density Mach 8 wind tunnel to determine its heat transfer characteristics. Such experiments help scientists devise thermal protection systems for the Langley concept, which is studied in facilities having test speeds ranging from subsonic through hypersonic. Langley scientists (top right) discuss details of air traffic control prior to beginning a simulated flight to study problems of integrating the supersonic commercial air transport of the future into the nation's air traffic control system. The simulation is part of extensive basic research by Langley to provide the technology for development of a

(center) was investigated to find ways to reduce the landing and takeoff distances required by jet transports. Large wing flaps, shown fully deflected, employ the boundary layer technique to increase the airplane's ability to fly at lower speeds. Langley conducts research with a variety of V/STOL models and full-scale vehicles to provide basic data useful in the design and construction of operational aircraft. A one-tenth-scale model of the tri-service XC-142A tiltwing airplane (lower left) is shown in the full-scale tunnel in research to study dynamic stability and control in transition flight, and an X-22A tilt-duct model (lower right) is released in a vertical wind tunnel which



IN OTHER LUNAR research, an Apollo model with launch escape system (top) casts its shadow in a transonic dynamics wind tunnel in aerodynamic tests; a Project Fire booster and reentry package (upper left) is viewed at Cape Kennedy, Florida, prior to an April 1964 flight in which vital scientific information at speeds of about 25,000 miles an hour-- slightly in excess of lunar reentry velocity-- was obtained; and an engineering designer (upper center) checks one of four large lunar maps being built as part of a unique Lunar Orbit and Landing Approach simulator. Looking further into the future, a model (upper right) is tested in a high-speed wind tunnel as part of a research program to determine entry vehicle shapes for use as future unmanned instrumented probes to study the atmospheric and surface properties of Mars. Scientific studies to establish a technological basis for a Manned Orbiting Research Laboratory are leading to new concepts, including one (lower left) based

on the Saturn 1B launch vehicle, with Gemini type ferry spacecraft clustered around its docking fixtures. A Space Radiation Effects Laboratory being built by Langley near the Center will house a magnet core (lower right) as an integral part of a synchrocyclotron for studying the effects of high energy particles, both electrons and protons, on space vehicles and their systems. The laboratory will be a focal point for a graduate study center operated by Virginia Associated Research Center in cooperation with the NASA.